

ATTACHMENT B

Remarks

Claims 1, 2, 5-10, 15 and 16 stand pending in the present application. By this Amendment, Applicants have amended claim 1 so as to utilize the term "consisting essentially of" in the main claim. Applicants respectfully submit that the application in its present form is in condition for allowance for reasons as stated below.

Claims 1, 2, 5-10, 15 and 16 stand rejected under either 35 U.S.C. 102 (b) or 35 U.S.C. 103 (a) by Schwab U.S. Patent No. 3,977,295 individually or in combination with McCollister et al. U.S. Patent No. 4,273,826; Grant et al. U.S. Patent No. 5,439,553 or Wanlass U.S. Patent No. 3,997,381. These rejections are respectfully traversed below.

The present invention is directed to a novel etching solution which has a ratio of etch rate of a boron silicate glass film (BSG) or boron phosphorus siliate glass (BPSG) to the etch rate of a thermal oxide film (THOX) at 25° C of 20 or higher. In order to more clearly recite the etching solution, by this amendment, Applicants have amended claim 1 to now recite "an etching solution consisting essentially of (i) hydrofluoric acid (HF), (ii) water in a concentration of 30% by weight or lower and (iii) at least one member selected from a group consisting of an organic acid, an inorganic acid having a pKa at 25°C of about 2 and an organic solvent having a hetero atom, whose content ranges from 70 to 99.9% by weight". The inorganic acid having a pKa at 25° C of about 2 distinguishes the claimed inorganic acid from strong acids which have a substantially lower pKa at 25° C such as nitric acid which has a pKa of approximately -1.5. However, the recited inorganic acid having a pKa at 25° C of about 2 includes sulfuric acid which has a pKa of around 1.92.

The presently claimed etching solution consisting essentially of the claimed constituents (i)-(iii) at their respective concentrations results in the claimed etch rate ratio which has unexpected and advantageous properties which would not have been obvious to one of ordinary in the art based on the cited references. Specifically, it would not have been obvious to one of ordinary skill of the art wishing to have the claimed etch rate ratio of 20 or higher to select the claimed constituents in the respective claimed concentrations.

Further evidence of the non-obviousness of the claimed invention is provided by a declaration provided herewith from one of the co-inventors, Mitsushi Itano (hereinafter the "Itano Declaration").¹ Referring now to the Itano Declaration, when the etching solution does not contain an (a) organic acid, (b) inorganic acid, or (c) an organic solvent as claimed, the BSG/THOX and BPSG/THOX etch rate ratios are significantly less than the claimed 20 or more. However, when an inorganic acid such as sulfuric acid is present around the claimed concentrations, e.g. at 70 wt. % or more constituent concentration, the etching solution has the claimed selectivity of 20 or more.

The prior art fails to teach or suggest the currently claimed etching solution. Schwabe discloses an etching solution consisting of HNO_3 (100g), H_2O (20gr \pm 50%), HF (4gr \pm 100), CH_3COOH (110gr \pm 20%) (see, column 1, lines 1 to 3 from the bottom). In contrast, the etching solution of the presently claimed invention excludes HNO_3 having a pKa of about -1.5, since claim 1 has been amended to exclude an additional constituent such as HNO_3 by replacing the "comprising" language with "consisting

¹ An executed declaration will follow shortly.

essentially of" language. Since HNO_3 is a main component in Schwabe, the present invention is not obvious from Schwabe.

McCollister discloses a solution containing 47 wt.% HF (1.2ml), 37 wt.% HCl (7.6ml) and 112 ml of alcohol consisting of 90.2 wt.% ethanol, 4.8 wt.% methanol, and 5 wt.% isopropanol (see column 4, lines 40 to 45). The solution of McCollister contains 7.6ml of concentrated HCl (pKa: about -7) which is much more than 1.2ml of 47 wt.% HF. In contrast, HCl is excluded from the etching solution of the present invention by the amendment to claim 1. Since HCl is used in a much higher amount than HF in McCollister, the present invention is not obvious from McCollister.

Grant discloses an etching composition in gas phase (see Grant, claim 1, etc.). Since the present invention is directed to an etching solution, the present invention is not obvious from Grant.

Wanlass discloses an etching solution containing HF (49 wt%), HNO_3 (70 wt%) and acetic acids (99.5 wt%) combined in the volumetric ratio of 1:3:8, respectively (see column 7, lines 10-14). Since Wanlass discloses an etching solution containing HNO_3 in a substantial amount and the present solution does not contain HNO_3 , the present invention is not obvious from Wanlass.

Based on the foregoing, Applicants respectfully submit that the present invention is not obvious from the aforementioned references. Accordingly, Applicants respectfully request that the rejections to the claims under 35 U.S.C. 102 and 103 be withdrawn.

In view of the foregoing, the Applicants respectfully submit that the application is in condition for formal allowance.

END REMARKS